Diode Application

① Limiter Clipping

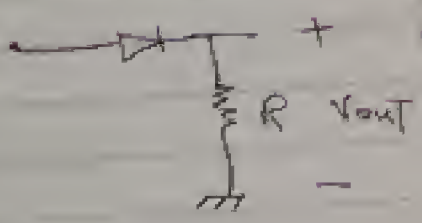
② Clamping

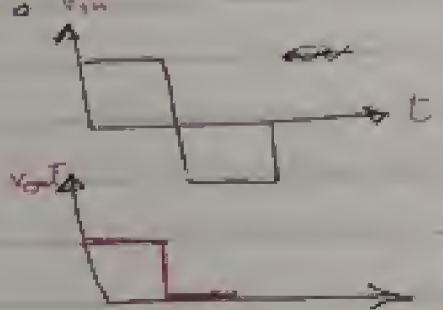
③ Voltage doublers

① * Limiter-Clipping.

① $V > 0$ → diode is on → $\therefore V_{out} = IR$

$V < 0$ diode is off → $V_{out} = 0$



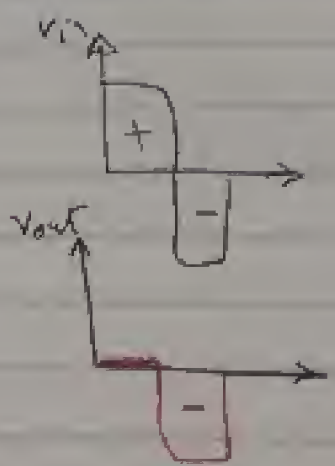


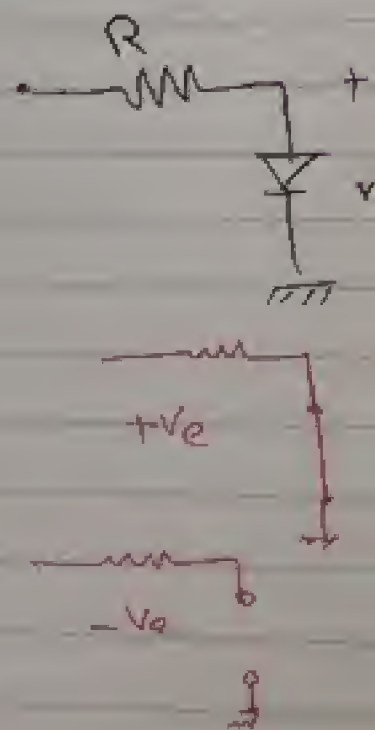
① +Ve half wave

$V_o = 0$

② −Ve half wave

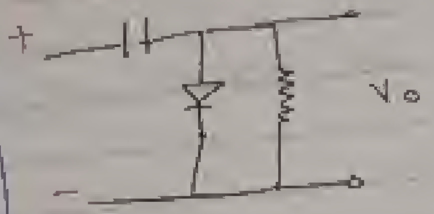
$V_o = V_{in}$



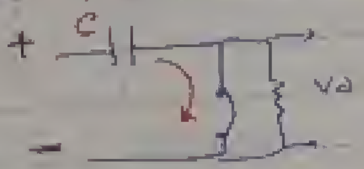


② Clamping :-

Clamping يعني في مكثف في الدائرة.

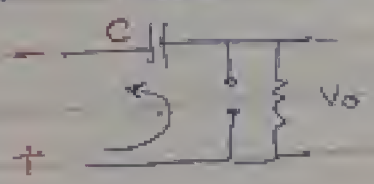


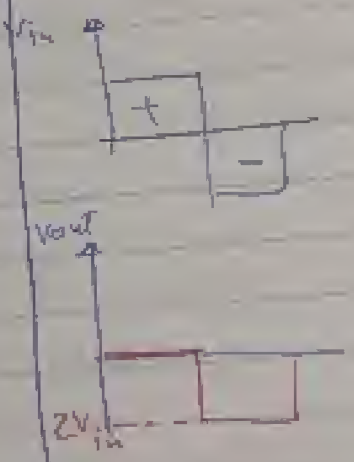
① $V_{in} > 0$ ∴ Diode is on → S.C



∴ $V_o = \text{Zero}$

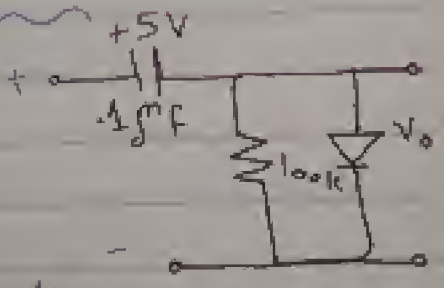
② $V_{in} < 0$ Diode is off → O.C





∴ $V_o = -2 V_{in}$

* في حالة ال Forward يشحن المكثف من يصبح $V = V_{in}$
* في حالة ال Revers. يكون الجهد على المقاومة $2V_{in} = V_c + V_{in} =$



$f = 1\,KHz = 1000\,Hz$

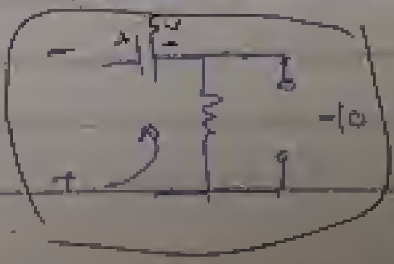
$T = \frac{1}{1000} = 1\,m.s$

① from $T = 0 \rightarrow T_1$ Diode is S.C

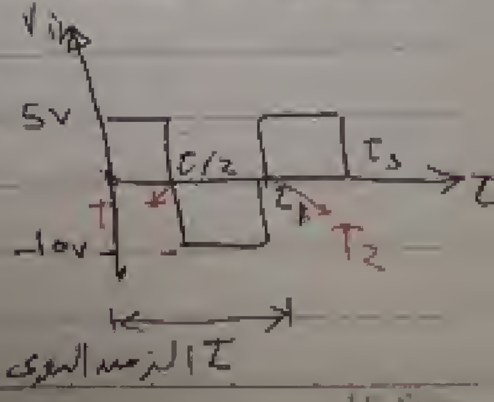
$t_1 = \frac{T}{2} = .5\,mS$

$V_{out} = \text{Zero}$

② from $t_1 \rightarrow t_2$ Diode is O.C

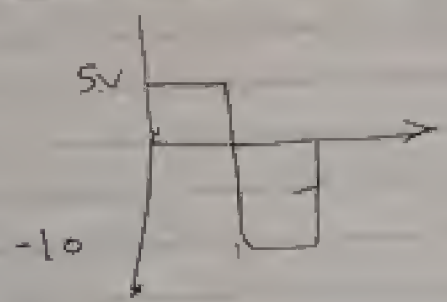


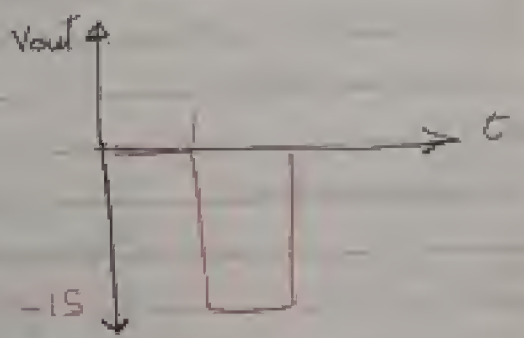
$V_{out} = -15$



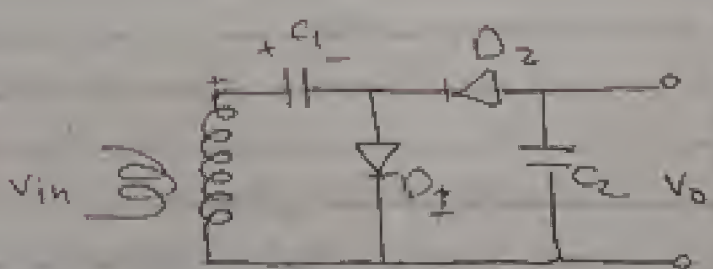
$\tau = RC = .1 * 10^{-6} * 100 * 10^{3}$

$\tau = 10 m.S$ زمن تفريغ المكثف





(3) Voltage doublers



* Double input with (-Ve) sign
. Inverted wave.

Forward $\Rightarrow$ $V_{out} = 2 V_{in}$

Reverse $\Rightarrow$ $V_{out} = -2 V_{in}$

transistoR

[1]* Switch مفتاح

off — on "Saturation"

[2]* Amplifie ... مكبر

"Active region"

او صوره كبيرة

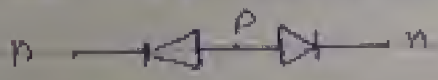
Playing → Biasing → ↑↑ Voltage

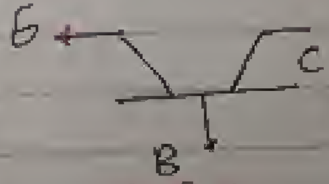
Sleep → " ↓↓

transistor

B قاعدة Base

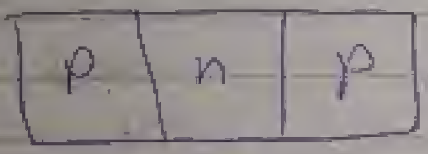
emitter E باعث ← | n | p | n | → C مجمع Collector

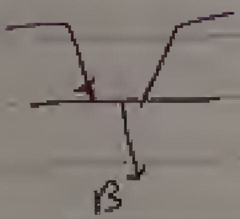




n-p-n

Back to Back Diodes



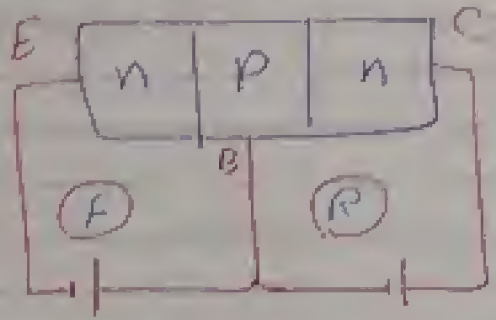


p-n-p

Active Transistor

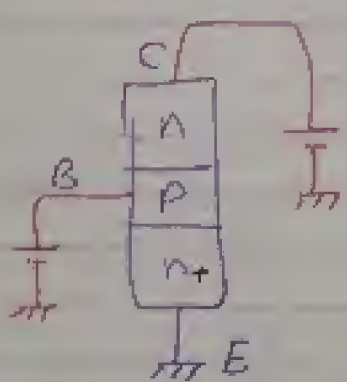
Amplifier

الترانزيستور كمكبر



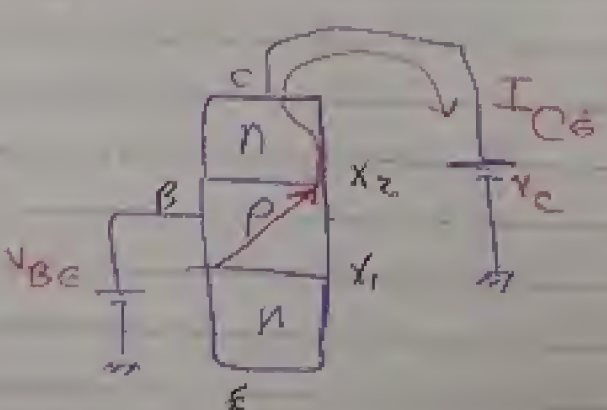
عشان الترانزيستور يشتغل
لازم الـ E يتعمل Forward
والـ C يتعمل Reverse

100A = تيار Base ⇐



* Collector Current

$$\Delta n(x_1) \propto \left(exp^{\frac{V_B}{KT}} - 1\right)$$



$$\Delta n(x_1) = \frac{N_E}{exp^{x_0/V_T}} \left(exp^{V_B/KT} - 1\right)$$

ثابت التناسب

N_E ← تركيز الشحنات في الـ emitter

$V_0 = V_T \ln\left(\frac{N_A N_D}{n_i^2}\right)$ ← Diode

$e^{V_0/V_T} = \frac{N_E N_B}{n_i^2}$ ← Transistor

بالتعويض في
المعادلة $\Delta n(x_1)$

⇒

$$\therefore \Delta n(x_1) = \frac{n_i^2}{N_B}\left(\exp^{V_{BE}/V_T} - 1\right)$$

$$J_n = q D_n \frac{dn}{dx} = q D_n \left(\frac{0 - \Delta n(x_1)}{W_B}\right)$$ → Base عرض

مساحة المقطع

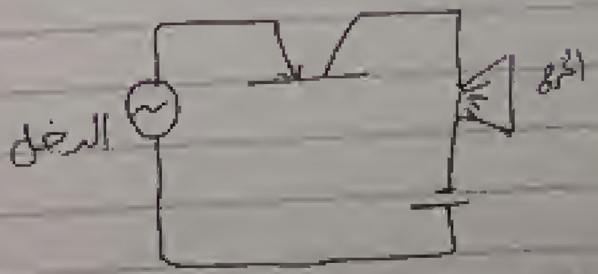
$$I_C = \frac{A_E * q D_n n_i^2}{N_B W_B}\left(\exp^{V_{BE}/V_T} - 1\right)$$

↓ I_S

$$\therefore I_C = I_S\left(\exp\left(\frac{V_{BE}}{V_T}\right) - 1\right)$$

الخرج ↓

(P-N-P)



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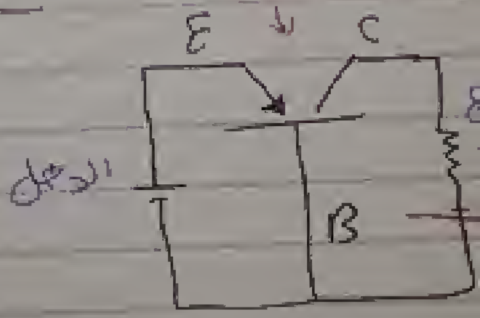


10 m.V　　　1 V

$1000 = \frac{1V}{10mV}$ = نسبة التكبير

$V_0 = V_T \ln\left(\frac{N_A N_D}{n_i^2}\right)$ ← Diode

$e^{V_0/V_T} = \frac{N_E N_B}{n_i^2}$ ← Transistor

⇒ بالمصطلحي

$\Delta n(x_1)$ الداخلة

$$\therefore \boxed{\Delta n(x_1) = \frac{n_i^2}{N_B}\left(\exp^{V_{BE}/V_T} - 1\right)}$$

$$J_n = q D_n \frac{dn}{dx} = q D_n \left(\frac{0 - \Delta n(x_1)}{W_B}\right)$$

W_B → عرض ال Base

مساحة المقطع

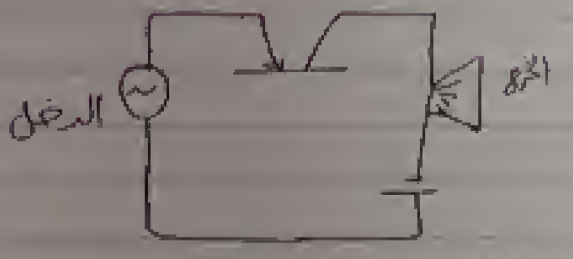
$$I_C = \frac{A_E * q D_n n_i^2}{N_B W_B}\left(\exp^{V_{BE}/V_T} - 1\right)$$

↓ I_S

$$\therefore I_C = I_S\left(\exp\left(\frac{V_{BE}}{V_T}\right) - 1\right)$$

تيار الخرج

(P-N-P)



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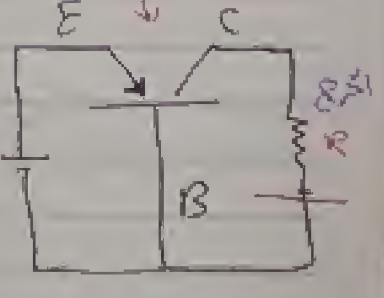

10 m.V — 1 V

$1000 = \frac{1\,V}{10\,mV}$ = نسبة التكبير